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DEPARTMENT OF AGRICULTURE.

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EDITORIAL NOTES.

Owing to unavoidable circumstances, the publication of the last three numbers for the year 1920 has been delayed. It has therefore been thought desirable to issue one number covering the balance of the year in order to complete the volume.

Mr. P. Waller, Dairy Instructor to the Tailevu Dairy Scheme, in a report to the Committee dated 9th December, stated that he considers the land set apart for the scheme well adapted for dairy farming and pig raising, the alluvial flats on the rivers being extremely rich and suited for growing the necessary crops and pasture, while the hills, which for the most part are low and easily accessible to stock, are covered with a rich friable loam which should produce an excellent pasture when sown with suitable grasses. Mr. Waller is of opinion that the climate in Fiji confers a definite favour upon the dairy industry because the country is free from droughts and the rigors of winter, both of which are serious obstacles in New South Wales.

At the recent meeting of the Legislative Council, the Noogoora Burr Ordinance was amended by the addition of a section setting forth how the provisions of the Ordinance may be extended to other weeds, which extension was already authorised by the Ordinance. In accordance with this amendment, a resolution was adopted by the Council extending the provisions of the Ordinance to the weed *Clidemia hirta* in the following parts of the Colony: The Provinces of Ra and Colo North and the districts in the Provinces of Colo East and Tailevu bordering these Provinces in the island of Vitilevu; all other islands of the group except the island of Taviuni and the small islands within three miles of its coast and those within three miles of the coast of Vitilevu except those off the coast of Ra and Colo North. The reason for this is to confine if possible the weed to the areas where it is now firmly established and particularly to eradicate it in certain parts of Vanualevu where it has recently been observed to have spread. The Proclamation dealing with this matter will shortly appear and the method to be prescribed for the eradication of the pest will be to uproot and destroy the plants by fire, or in the case of plants which have not fruited, to spray with a weedicide sufficiently powerful to destroy the plants.

The Hon. F. C. Clapcott at the recent meeting of the Legislative Council moved a motion that the close season for certain pigeons which have taken to feeding upon rice crops be altered to enable these birds to be shot when these crops are maturing. It may be remarked that a person is generally entitled to protect his property against the depredations of animals, even when these are privately owned.

At the meeting of the Legislative Council recently a sum of £500 was voted for the purpose of making a further effort to introduce into Fiji from Tahiti parasites for the coconut scale. Mr. H. W. Simmonds left in September in anticipation of this vote and has commenced work there, a result of which was the receipt of a coconut by the "Karori" on 3rd December. This palm was found to be plentifully supplied with live scale. There are two chalcid parasites for this scale in Tahiti, one of which was introduced into Fiji on several consignments of coconuts received during the former mission to Tahiti, but there was some doubt as to the second one having been introduced. As this latter parasite is likely to be more generally useful than the one which had been introduced, it is the one to which Mr. Simmonds is paying chief attention. It is therefore with considerable pleasure that we can record finding numerous specimens of this particular parasite on the coconut palm recently received. A number of small coconut seedlings had been previously inoculated with scale, and these palms have been disposed around the imported palm so that the parasite may spread on to them, when they can be distributed into scale-infested areas, the imported palm being kept in Suva in the large insect cage for further use. Subsequent inspection has shown that the parasites have transferred their attention to the small coconut seedlings.

ANALYSES OF TWO NEW GRASSES.

By C. H. Wright, Government Chemist.

Two grasses have been received from the United States Department of Agriculture, and are at present growing at Nasinu Experimental Station. These two grasses are Carib grass (*Eriochloa subglabra*) and Mission grass (*Pennisetum setosum*). Samples of these two grasses were taken for analysis on 21st December, 1920. At that time both grasses were bearing seeds, but samples for analysis were taken from the young stools about 2 ft. 6 in. high, which would be suitable as fodder. The samples were then taken to the Laboratory, and on arrival there were found to contain the following percentages of water:—Carib grass, 81·81; Mission grass, 89·04. The remainder of the samples were cut up and dried at air temperature. The air-dried material was then finely ground up and analysed with the following results:—

Name.	*Carib grass.*	*Mission grass.*
Water	14·57	14·38
Protein	10·63	8·44
Oil	3·16	3·04
Carbohyrates	34·43	36·73
Fibre	28·43	26·77
Ash	8·78	10·64
	100·00	100·00
Nitrogen	1·70	1·35
Silica	4·82	8·46

From the above results the analyses of the fresh grasses can be calculated. These are as follows:—

Name.	*Carib grass.*	*Mission grass.*
Water	81·8	89·0
Protein	2·3	1·1
Oil	0·7	0·4
Carbohyrates	7·3	4·7
Fibre	6·0	3·4
Ash	1·9	1·4
	100·0	100·0

As there are several methods of determining fibre it is advisable to state that the fibre in the above grasses was determined by the method adopted by the American Association of Official Agricultural Chemists. The other constituents were determined by the usual methods and hence these analyses are comparable with those published in American books. For the sake of comparison I give below analyses of some grasses and green fodders; these are taken from *Feeds and Feeding* by Henry and Morrison (Madison, Wisconsin, 17th edition, 1917).

Name.	*Water.*	*Protein.*	*Oil.*	*Carbo-hydrates.*	*Fibre.*	*Ash.*
Para Grass ..	72·8	1·7	0·5	13·4	9·2	2·4
Guinea Grass ..	71·5	2·2	0·7	12·1	10·9	2·6
Maize Fodder ..	78·1	1·9	0·6	13·0	5·2	1·2
Sugar-cane Tops	76·6	1·3	0·4	11·8	8·0	1·9

Grasses like all vegetable products vary in composition, depending on the climatic conditions (particularly rainfall), and to a certain extent on the soil on which the grass is grown. But the composition of a grass depends to a far larger extent on the state of maturity; the more mature a grass is the smaller is the quantity of water and the larger is the quantity of fibre contained in it. The large quantity of water in Mission grass and the fairly large quantity in Carib grass may thus be partly due to the fact as explained above that I took samples of these grasses from young stools, which I considered to be more suitable as fodder than the older stools, which were in seed. But even at best a chemical analysis of a grass or other feeding-stuff is only a partial guide to its feeding value. A chemical analysis gives the total percentage of each constituent, but the whole of each constituent is not utilized by the animal to which it is fed, since only a certain proportion of each constituent is digested. The actual percentage of each constituent digested—the digestion coefficient— can be determined only by experiments on living animals. Then, too, the chemical analysis does not include the palatability, because it cannot be measured; but it is obvious that this is a most important factor, since animals will refuse a food which is unpalatable no matter what its chemical composition is. On the other hand many foods which according to chemical analyses appear to have low feeding values are readily eaten by stock. Then, too, in considering a fodder grass such questions as the ease or otherwise of propagation and yield must be taken into consideration. All these questions can only be settled by actual trial, and the observation and judgment of the planters in Fiji will eventually show whether Carib grass and Mission grass are useful fodders or not.

NOTES ON THE CONNECTION BETWEEN CLIMATE AND THE CROPS.

When banana bulbs, cuttings of sugar-cane, or rice seeds are put in the soil, the cultivator is inclined to imagine that he performed much work which in time will be rewarded by "nature" by a bounteous crop. He accepts this as a matter of course and would be inclined to consider himself badly used if the crop fails or to regard himself as unjustly treated if it did not come up to his expectations.

The possessor of an engine which will generate motive power knows how useless it would be to expect that engine to give power unless it is supplied with fuel, upon the combustion of which the engine depends for its energy. "Work" of any kind can only be performed by the expenditure of a corresponding amount of energy, and this is just as true for the processes of nature which we are inclined to take as a matter of course, as it is for the mechanical contrivances which have been resulted from the inventive genius of man.

Now the growth of a crop necessitates the expenditure of energy more or less continuously during the life of the plant. The cultivator, with the small amount of work he did in preparing the land, planting the seed and the cultivation given subsequently, has not provided the smallest amount of "fuel" for the machinery which performs the work of producing the crop. He has merely provided favourable conditions for this machinery to work easily, in the same way as an attendant would oil an engine and keep it in good mechanical order—very necessary of course, for on the care and attention he devotes to this work part of the efficiency of the machinery depends.

The "power" which enables nature to grow our crops for us is derived from the energy of the sun's rays, partly in the form of heat and partly light. In a general way this is clearly seen from the fact that at the places on the earth's surface where the mean temperature is high, such as in the tropics, certain other conditions being favourable, vegetation is most luxuriant; while at the two poles, the vegetation is extremely scarce. Indeed it is found that the time taken by certain crops to ripen depends upon the average temperature.

Professor S. Cooke, M.A., in *The Foundations of Scientific Agriculture*, as an example of a crop requiring the same total amount of exposure to the sun to mature, no matter what the latitude be in which it is grown, gives the following information:—

	Period of growth. (*days*)		*Mean temperature.*		*Total units.*
Wheat crop, near Poona (India)	115	×	74 °F	=	8,510
Near Edinburgh	182	×	47·5 °F	=	8,645

The mean temperature is taken as a measure of the amount of sunlight at that particular latitude, and the figures clearly indicate the way in which this influences a crop.

Observations of the temperature of the earth, or rather of the atmosphere at the earth's surface, over long series of years, have shown that the mean annual temperature is constant. Since radiant energy is continually being received from the sun it follows that exactly the same quantity must disappear. Some is lost by being radiated into space, and the balance represents the quantity utilised by plants, which during their lives are continually transforming this energy into other kinds, storing it up in their tissues, from which it can be obtained again in various forms by suitable means.

Indeed it is on the energy so stored that we depend for nearly all industrial purposes, since coal consists of fossilised plant remains. It may be mentioned that with the methods at present in use, of burning the coal under a boiler and using the steam so produced to work an engine, we obtain only from 5 to 10 per cent. of the energy contained in the coal, the balance passing away with the furnace gases and being lost to us. It is deplorable that energy stored up slowly and through vast periods of time should be wasted in this manner. And the time is rapidly approaching when it will be imperative that if we are still dependent upon our coal supplies for energy for industrial purposes, some more economical means of using them must be devised and put into use. This is mentioned merely as a matter of interest, but it is outside the planter's business.

The source of energy which enables our crop to grow has now been indicated. The duty of the careful planter is to see that the conditions are as favourable as they can be for full advantage to be taken of this free supply of energy. The inquisitive planter however may not yet be satisfied that sunlight is alone responsible for the growth of plants for he knows that plants live on material they extract from the soil and from the air.

Books have been written on the soil, its constituents and treatment, and surely the materials extracted from the soil by the plants should receive part of the credit for growing a crop. A reference to the owner of the steam engine, may help us. He knows that he cannot expect his machine to work, no matter how fierce is the fire in the furnace, unless the boiler contains water upon which the fire acts and through the agency of which the energy in the fuel is converted into mechanical energy in the engine. The plant foods in the soil and certain material in the air are required by the plant, which, by means of the energy of the sun's rays, transforms them into products which it either uses to build up new tissues or stores away. It is well to remember that no matter how rich a soil may be in all the necessary materials required by the plant, no crop could possibly be grown were it not for the energy supplied by the sun's rays.

The question of sunshine does not end the influence of the weather on the growth of crops however, although it is the primary cause of this growth. The planter knows, from bitter experience probably, how too little or too much rain can adversely affect his crops. In many countries where all conditions are favourable for the growth of crops, except the rainfall, the soil has been artifically supplied with the necessary moisture by irrigation, and vast areas of land in different parts of the world have been brought under cultivation by this means. In Fiji on the larger islands droughts are the exception, but periods, of even short duration, of little or no rain can leave their mark on the year's production, when they occur at the planting time for crops like sugar-cane and rice, or when the grain is filling in the case of the latter crop. The Fijians found out for themselves the necessity for irrigation in the case of special crops like taro. Whether it would pay to institute a system of irrigation for other crops could be determined by a consideration of the loss due to a drought as determined by the difference

between the value of the actual crop following a drought and the value of the average crop, together with the frequency of droughts on the one side and the cost of the irrigation scheme on the other side.

Even in times of normal rainfall, the irrigation of land can be a perfectly sound procedure, since water can be given to the plants at exactly the right time, enabling the maximum crop to be produced. The population of the world under normal conditions is steadily increasing each year and it is doubtful whether a regular corresponding increase takes place in the areas cultivated. Hence it is not likely that there will ever be any large surplus of food or certain other commodities. Indeed the tendency appears rather to be in the direction of a shortage in many items. In places where the tillage of the soil, the selection of seed and other matters connected with the growing of crops have been brought as near perfection as seems possible, and where rigid economy is combined with efficiency in all cultural and other operations, it is difficult to suggest how the planter is to increase his returns to keep pace with his expenses, which apparently everywhere, have had a tendency to increase. One thing which will most certainly have to be dealt with sooner or later is the elimination, at any rate with certain crops, of the " poor season," which reduces the average returns very considerably. And one factor which can be counteracted artificially is the loss caused by the irregularity of the rainfall.

Undoubtedly in time it will be found that even in the tropics where rainfall is regarded as abundant, the installation of an irrigation system will be a necessity to enable full advantage to be taken of the other favourable conditions for the production of satisfactory crops regularly year by year. It must certainly be noted that too much rain can produce effects disastrous almost as too little. The planter can certainly, and with no great outlay, provide against the ill effects of too much water in the soil, by providing his land with a proper drainage system, and it is worthy of special note that increased drainage affords the plant a better chance of withstanding droughts, for the drier the soil, the better the root system developed by the plants, and an improved root system enables the plant to draw its moisture from more soil, hence when a drought sets in the plant is under much more advantageous circumstances than a similar plant which had a poorly developed root system.

RAT DESTRUCTION.

A note in the *Journal of the Ministry of Agriculture*, June, 1920, again draws attention to the necessity for energetic measures to be taken for the destruction of rats and mice. Both from an economic and a sanitary point of view, it is highly desirable that these pests should be ruthlessly exterminated. The Rats and Mice (Destruction) Act, of 1919, placed power in the hands of local authorities to carry out effective measures for the destruction of these pestiferous rodents. It is primarily a matter for local effort, and already many county and borough authorities in England have shown praiseworthy energy. For instance, there is a record of 60,000 rats destroyed in Nottinghamshire in seven months, and of 41,000 in the North Riding of Yorkshire, and 80,000 in Hertfordshire during a period of four months.

It would seem that if co-operative measures were taken in any one of these smaller West Indian islands, owing to the fact of their limited area, and consequently the possibility of guarding against renewed infestation from abroad, it ought to be possible to exterminate rats and mice.

It may be mentioned that a research laboratory has now been established by the British Ministry of Agriculture with the object of endeavouring to discover rat poisons that are not injurious to domestic animals. The aid of science is also enlisted to improve the poisons already in use.

One of the poisons containing squills or barium carbonate should be used, unless there is no danger to other animals or to human beings, when the use of stronger poisons, one of the standard phosphorus preparations for instance, may be efficaciously employed.

To those who may desire to make their own baits, or to have them prepared by local chemists, the following recipes may be found useful;—

1. Barium carbonate .. .. 6 oz.
   Meal .. .. 16 ,,
   Dripping .. .. 4 ,,
   Salt .. .. ½ ,,

This makes 1,000,000 baits of 6 grains each (*i.e.*, pieces as large as a hazel nut).

2. Barium carbonate .. .. 4 oz.
   Biscuit meal or plain meal .. 4 ,,
   Oil of aniseed .. .. .. 5 drops.

Mix with fat to a paste, and lay out in pieces the size of a hazel nut in places where rats are known to be present. (*Agr. News*, Barbados, 1920, Vol. XIX, No. 478.)

The formula No. 1 has been used in buildings where paddy is now stored and the bait was eaten almost immediately and numbers of rats have been found dead in the building subsequently. This method of destroying rats is about to be used on a large scale. For convenience in preparation and application it is certainly to be recommended for use in all buildings where produce is stored and the attacks of rats are noticed.

In Suva at the present time rats appear to be extremely numerous, and owners of all buildings such as referred to above are advised to give one of these formulæ a thorough trial.

IMPERIAL BUREAU OF MYCOLOGY.

An Imperial Bureau of Mycology has been established at 17 Kew Green, Kew. Dr. E. J. Butler, M.B., F.L.S., Imperial Mycologist to the Government, has been lent by the Government of India to carry out the duties of Director.

In a letter to the Superintendent of Agriculture dated 8th November, Dr. Butler states that it is intended to model the Bureau on the existing Imperial Bureau of Entomology the objects of which are:—

(1) To organise a system for prompt identification of all injurious insects for Departments of Agriculture and Public Health;

(2) To publish a monthly journal for summarising British and foreign literature;

(3) To compile a card index to literature, past and present, so as to be able to supply information in response to inquiries;

(4) To develop in various other directions as may be found advisable.

Of these, the second function is likely to be deferred by the Bureau of Mycology until such time as further funds become available. Its place will be taken by the supply of information direct in response to inquiries.

Facilities will be provided at the Bureau to enable mycologists to carry on work in which they are interested when on leave in England or visiting there, but apart from systematic and culture work, it is not likely that, so far as can be foreseen at present, the Bureau will be able to undertake original research on plant disease, as Dr. Butler is strongly of opinion that such work can only be done on the spot.

It is clear, says Dr. Butler, that the Bureau will fail in its objects unless it can secure the hearty support and co-operation of overseas Departments of Agriculture and Botany by sending in collections of parasitic fungi for identification and making every possible use of the Bureau in any direction in which it is at all likely that service can be rendered.

Such a Bureau is one of which all isolated workers must have long felt the need. The number of mycologists has always been inferior to the number of entomologists and the study of plant diseases due to parasitic fungi has therefore not reached nearly so advanced a stage as the study of economic entomology. The Bureau therefore cannot fail to be of the greatest service to Colonies such as Fiji whether provided with specially trained mycologists or not.

Referring to my own experience in Fiji considerable assistance has in the past been obtained from mycologists in the larger tropical Colonies and from the Royal Botanical Gardens, Kew. But there was always the feeling that one was encroaching upon the time of officers whose duties were quite sufficient to occupy fully their attention. The establishment of the Bureau will enable the results of the studies of all these workers to be collected and made immediately available for others without taking up the time or attention of the officers themselves.—C.H.K.

FALL OF COCONUTS.

The following list shows the results of recording the monthly fall of 36 coconut palms for three years, the figures being the average of the three years, calculated as the percentage of the total average number of nuts for the whole year:—January, 8·5; February, 8·6; March, 11·0; April, 11·3; May, 11·0; June, 8·2; July, 8·6; August, 8·0; September, 5·8; October, 5·9; November, 6·8; December, 6·2; total, 99·9. Plotted out as a curve, these figures give a fairly regular curve with maximum and minimum in April and October respectively, and resembling the rainfall curve closely, but with maximum and minimum some two months later than the latter.

RICE SUPPLY FROM INDIA, 1921.

The following information relating to the supply of rice from India for 1921 is published for general information:—

Telegram from the Government of India to the Government of Fiji.

6th December, 1920.

It has been decided by Government of India to modify considerably the system of control of exports of Burma rice to foreign countries during next year. Traders will be allowed as from 1st January, 1921, to make own arrangements for sale and export to foreign destination, subject only to the condition that such exports will be permitted only under licence granted by Rice Commissioner, Rangoon, within limits of total quantity sanctioned for export, which has been fixed for the present at one million tons. Applicants for licences will be required to submit particulars of all transactions to Rice Commissioner. Should prices in Burma rise above equivalent to present control maximum rate of 180 rupees per hundred baskets of Paddy, Government of India reserve to themselves full power to re-impose a system of strict control similar to that in force in present year. In the event of re-imposition of strict control supplies to you will be at cost price of approximately 9 rupees per cwt. f.o.b., but we cannot of course guarantee what quantity may then remain available for export. Existing prohibition on the export of rice from India proper to foreign countries will be retained.

REPORT OF THE GOVERNMENT CHEMIST FOR THE MONTH OF DECEMBER.

By C. H. Wright, Government Chemist.

The number of samples received during December, 1920, was 17. These may be classified as follows:—Private, 1; Customs, 3; Constabulary, 4; Receiver-General, 5; Medical Department, 2; and Agricultural, 2.

Customs.—These consist of three samples of tea.

Constabulary.—These consist of four samples of hop-beer.

Receiver-General.—These consist of drinking-water from the tanks of five light-houses.

Medical Department.—These consist of two samples of acid sodium phosphate received from the Government Pharmacist.

Agricultural.—These consist of two fodder grasses growing at Nasinu Experimental Station which have been recently received from the United States Department of Agriculture.

Of the above 17 samples the analysis of 15 were completed during the month, the two samples not finished being the two grasses from Nasinu which have to be dried at ordinary temperature (and this takes some time) before they can be ground up for analysis. During the month of December I also analysed four hop-beers and five drinking-waters received during the month of November, so that during the month of December I analysed 24 samples; and most of this work was done from about the 14th to the end of the month, because as I mentioned in last month's report I occupied the new laboratory on the 7th December, and it took about a week to transfer the apparatus, &c., to the new laboratory and get things into working order.

New Laboratory.

The new laboratory is a two-storied concrete extension to the old laboratory, and is connected with it by a door in what was formerly the outside wall. The extension is made up of a new front door (opposite the back door of the Post Office), an entrance hall, store-room (14 ft. by 10 ft.), sampling-room (12 ft. by 10 ft.), gas machine-room, and a water closet. The store-room is on the south-east corner of the building and was purposely placed there so that the afternoon sun would not reach this room. On the other hand the sampling-room, which is used for drying and sampling soils, grasses, copra, &c., was placed on the south-west corner of the building so that it would be exposed to the full rays of the afternoon sun. It is thus the hottest room in the building, but considering the purpose for which it was designed this is a great advantage.

The staircase leads to a landing upstairs, from which entrance is gained to the old laboratory, and the new laboratory. The old laboratory is now the clerk's office, and the bench, cupboards, shelves, &c., are left as they were as they are still of use. One important addition has however been made to this room, viz., a large glazed earthenware washing-up sink with a draining board for washing and drying chemical apparatus.

The new laboratory is 20 ft. by 14½ ft. with a recess (on the north wall) 6 ft. by 6½ ft. The room is thus L shaped, the longest (west) wall being 21 feet long. At the north-east corner of the room is the balance table. The balance table is L shaped. On one arm of the L the balance is placed, whilst the other arm on the right-hand side of the balance affords a support for the right elbow when weighing and also serves as a table for the laboratory note-book. On the east wall is a writing-table and a bench, 3 feet high and 2 feet from back to front. A bench of the same dimensions is continued the whole length of the south wall. Above it are shelves for reagent bottles and below it (in different parts) cupboards, drawers and shelves. A gas pipe for petrol-air gas is fixed along the front of the bench with polished gun-metal gas nozzles.

In the recess mentioned above is the fume cupboard. This is 6 feet long and 2 ft. 6 in. from back to front, and the bottom is 3 feet from the floor. The front of the fume cupboard consists of two sash windows with weights. The base of the fume cupboard inside is sheet lead, the back and side are the cement walls, and the back of the weight boxes inside the cupboard are covered with fibrous cement. The top of the cupboard is also fibrous cement, and through this pass two lead flues which are continued upwards through the roof of the building. Along the front of the fume cupboard is a gas pipe with 6 gas nozzles, supplying gas to burners within the cupboard; whilst a small sink with a three-way tap on the left of the cupboard supplies water connections, when it is necessary to use a condenser or constant level-water bath inside the cupboard.

In the centre of the room is a centre bench 9 feet long and 4 ft. 6 in. broad and 3 feet high. Down the centre of the bench is a lead-lined drain 6 inches wide. Above this drain are polished gun-metal water taps, the orifices of which are 15 inches above the bench top. These taps serve as water connections for condensers, filter-pumps, constant level-water baths, &c., the outflow from which runs into the lead-covered drain, and by this arrangement there is a great saving of India-rubber tubing. At each end of the bench is a semicircular glazed earthenware sink above which is a polished gun-metal water tap. Along each side of the bench is a gas pipe with 5 polished gun-metal gas nozzles. This centre bench is a copy of one in the Agricultural Department of the University of Leeds, where it had (when I saw it last year) been in use for about five years and had proved perfectly satisfactory.

In conclusion I beg to thank the Government for kindly allowing me to choose the sinks, water-taps, and gas nozzles during my leave in England last year. I also thank the Government for allowing me to design the building and fittings; and I take this opportunity of thanking the Public Works Department for the able way in which they have carried out my ideas. I spent some time during my leave last year in making enquiries from scientific friends about laboratory fittings, and owing to their kind advice and help the Colony is now in possession of a really up-to-date chemical laboratory.

NOTES ON WEATHER OBSERVATIONS DURING THE HURRICANE SEASON.

By C. H. KNOWLES, B.Sc.

With the arrival of the period of the year usually included in the term "the hurricane season" one is inclined to take more interest in the weather than at other times, and this shows itself perhaps by a closer scrutiny of the 'movements" of the barometer.

It should be remembered that the barometer is an instrument to measure the pressure of the atmosphere and that unless it is what is known as a mercurial barometer and made to a certain standard specification and design, and has been tested against reliable instruments, its indications are not to be accepted as accurate. Owing to the want of portability and to certain complications in making use of it, the standard mercurial barometer is not suitable for ordinary domestic purposes; what are known as Aneroid barometers are now obtainable at a reasonable cost, and being fairly reliable for the purposes referred to below, are in general use.

One of the chief characteristics of a violent storm is that the atmospheric pressure at the centre is much lower than that outside the storm and there is a gradual fall towards the centre. In fact this fall extends sufficiently distant from the actual area disturbed by the storm as to afford an automatic indication of its approach. For this purpose it will be apparent that the actual pressure of the atmosphere is not so important as knowledge as to whether the pressure is rising or falling? The writer has noticed cases where observers appear to have derived considerable satisfaction from the indications of Aneroid barometers which were in such a condition as to warrant not the slightest value being attached to their indications.

The writer would advise that except for the purpose of observing by how much subsequent observations differ from one another, no attention whatever should be paid to the figures on the scale. When the indications of Aneroids are brought to the writer's notice he is not uncommonly informed that a certain barometer is set "very high" or "rather low," or whatever it may be which is merely another way of saying that the indications of the instrument are inaccurate, and since it if was properly set, no reliance could be placed upon its readings unless means were at hand for comparing it at regular intervals with a standard barometer, it is a matter of little importance whether the setting be high or low, so long as the mechanism is sufficiently delicate to show the *variations* in the pressure. The movements of the sides of the vacuum box, on which depend the working of the instrument, are very small and are magnified by levers, and turned into a circular motion by means of a spindle which carries a pointer—the finger of the barometer. There are a number of joints and bearings, at all of which friction is, and "play" may be, introduced. The combination of friction and "play" may be sufficient to prevent the finger from following the movements of the vacuum box sides, and it is usually considered an essential part of the observation, that the case of the barometer should be tapped to see that nothing has stuck. The vibration so set up, enables, it is supposed, the finger to point accurately to the proper part of its dial. A barometer which requires a jar of this kind clearly must be affected by so much friction as to render its indications practically worthless.

The writer remembers an Aneroid being pointed out by its owner as a splendid glass, no nonsense about it, never varies by so much as a fraction of an inch unless there is a storm in the vicinity. Marks on the glass cover had been made showing the minimum readings during certain storms of many years before. The writer was fully prepared to concur in the opinion that it would take a severe storm to affect it, because a very short examination showed the spindle fixed in its bearings by rust, which rendered it quite unaffected by minor variations in the atmospheric pressure, although evidently the diligent tapping upon its face had been able, formerly, to awaken the instrument to some sense of its responsibilities when a considerable fall had taken place.

Before Aneroid barometers reached their present state of perfection, the usual household barometer was a mercurial one, the mercury of which was contained in a tube shaped like a U, with one limb much longer than the other. The indications of this form of barometer were made on a dial by means of a pointer turning on a central spindle. Motion was imparted to this spindle by a fine cord attached to a float on the surface of the mercury in the shorter arm of the tube of the barometer. Owing to the friction of the float against the sides of the tube, the former frequently would not follow closely the movements of the mercury surface, particularly when the pressure was rising, hence it was necessary to rap the instrument to make certain that the float was really floating on the mercury and had not stuck in the tube. It is certain that this practise has led to the general tapping of domestic barometers.

The Aneroid used by the writer is a 4½ in. brass cased Aneroid and it shows a variation in the pressure of ·002 in. Since, during a storm, the violent vibration in the pressure creates sudden movements in the mercury of the standard barometer, the adjustment and reading of the latter cannot be accurately made, the Aneroid is relied upon for observations during storms. It is of course frequently checked against the standard. It may be mentioned that its cost was somewhat in the neighbourhood of £3 and it has been in use for many years, has never failed to show variations within its capacity, and of course it is never submitted to the indignity of being tapped.

Whether or not a particular barometer is reliable as an indicator of the variations in the atmospheric pressure could only be decided by an examination of the condition of its working parts and a comparison of its indications with the pressure of the atmosphere as determined by a standard barometer. The owner of an Aneroid can, however, with a little care, satisfy himself as to whether the indications of the barometer properly follow the variations of atmospheric pressure. The pressure of the atmosphere never remains constant for very long. Indeed it is subject to two regular falls and two rises each 24 hours. In Fiji these variations are remarkably constant, and provided the observations are sufficiently extended, the owner of a barometer may make use of the knowledge of them to test the sensitiveness of the instrument.

The maximum pressures occur at about 10 a.m. and 10 p.m.; minimum pressures at about 4 a.m. and 4 p.m.

All that has to be done is to take observations, and note them for future use, at fixed hours morning and evening, say 9 or 10 a.m. and 4 p.m. The average of the differences between the morning and evening readings taken over a sufficient period should be ·07 in. The longer the period of observation the more closely will the average difference approach ·07 in., but if the average of at least 10 days' observation, which need not be consecutive, is

not below ·05 in. or more than ·08 in., the test may be considered concluded and the instrument satisfactory. If not within these limits the test should be continued, but if after 25 days' observations the average difference is still not within ·02 in. of the figure ·07 in. referred to above, the instrument is not one to be relied upon.

The writer is not infrequently asked during the hurricane season, particularly at times when the atmospheric pressure is somewhat below normal, if he is aware that the barometer is "falling." When such queries are made during office hours it is of course almost certain that the fall in pressure, the subject of the inquiry, is merely in accordance with the natural variation. Indeed the incident would be more worthy of notice if the pressure, during the period 10—4 o'clock was not falling. A fall therefore from 10—4 o'clock is expected and must be looked for, but equally surely should there be a rise from 4 to 10 o'clock and all persons interested in weather observation are advised to observe where the pointer of the barometer is at 4 p.m. and then look, at intervals of half an hour or so, for an increase in pressure—or a rise in the barometer as it is often spoken of. If the atmosphere is not unduly disturbed this rise should have commenced before 6 p.m. and if it has not and if the instrument is in good order, the indications should be closely watched for a further fall, for a reduction in pressure at that time—and particularly if the rate of fall increases—will most certainly indicate the approach of a disturbance and precautions should at once be taken, but if the increase in pressure is found to take place, then no disturbance need be feared for the next 12 hours at least.

COTTON SEED SUPPLY.

A supply of about 40 lb of Sea Island cotton seed from St. Vincent and Barbados has been secured, and arrangements are being made for this seed to be planted so as to secure as large a yield as possible.

Usually a few seeds are planted at each place, which with distances of 5 ft. by 2½ ft. necessitates the use of about 5 lb of seed to plant one acre. As the plants grow, the weaker ones are gradually removed until only one, the strongest, is left at each spot. It would be possible to follow this method and to utilise the seedlings so removed to plant up further areas, thus ensuring that whatever area was put under cotton was fully planted up. There is, however, the risk that the transplanted seedlings might not all grow, and in any case the check resulting from the disturbance to the roots would adversely affect the resulting plants. The method which it is proposed shall be followed therefore is to plant single seeds, thus making the greatest possible use of the seed. It is to be expected however that some of the seeds may not germinate or if they do germinate, that the resulting plants from a proportion of the seeds will be poor plants. A number of blank spaces is therefore to be expected from this method of planting and that the resulting stand of cotton plants will show a want of uniformity in vigour. The planter will be expected to use judgment in picking cotton from the plants, taking steps to have the cotton from stunted or undersized bushes picked and stored apart from the produce of well-grown bushes.

As the chief object of the planting of this seed is the production of seed for use the following season, stained seed-cotton should be picked provided it is kept separate from clean cotton, since, provided the seed is mature, and the produce of well-grown bushes, the seed from stained cotton may provide satisfactory seed.

The seed from clean mature bolls the produce of well-grown bushes will of course be the most satisfactory seed and provided sufficient of such seed is obtained to meet the demands, there would be no need to make use of the seed from stained cotton or the produce of undersized plants. The extent to which seed of the last-mentioned descriptions may require to be used will have to be decided by considerations of the crop resulting from the imported seed and the demand for seed the following season.

EXTRACTS FROM REPORTS OF INSPECTORS.

Mr. M. A. Forsyth, Levuka, reports as follows:—

Inspection of vessels.—During the month of September 64 vessels reported at the Port for inspection and material was destroyed in 18 cases. I have laid information against four vessels for evasion of the law. Three of these have been trading from an infected area to a clean area without calling for inspection. It has been difficult to obtain the necessary evidence and I am hoping to secure heavy penalties as a deterrent to other vessels which I feel sure are doing the same thing. An offer of a reward for information leading to a conviction would help matters a little, I think. It might induce the Fijians in the villages to report such evasions.

Coconut scale.—I have visited various places on this island during the month, and also Wakaya, Batiki and Gau. There is no further spread of the disease on Ovalau. With Mr. Simmonds I visited Bureta and placed two palms, which it is hoped are parasitised, among some heavily-infected trees there.

At Wakaya there is no reappearance of the scale. The manager and his assistant keep a careful watch and at the least sign of the disease destroy the plant. There appears to be a clearance of the scale from bush trees there also.

On my way to Gau, where scale had been reported on yaqona, a call was made at Batiki owing to bad weather. I inspected as much as possible there while waiting for the sea to moderate. I could find no sign of scale either on coconuts or other trees. This island suffered heavily during the hurricane and recovery, especially in some strips, is slow.

Gau.—I spent several days inspecting here. Right through the nuts are looking well and there are prospects of good crops. Trees show good recovery from the hurricane, are healthy and free from disease. Bush trees were also found free from any scale. On two yaqona patches however I found several plants heavily infected. These were immediately destroyed by burning. No other plant round or near the yagona was infected, and I feel sure the attack is only local. I tried to trace the source of introduction, and though I could get no authentic evidence, I am inclined to think some of the plants were introduced from Tailevu, possibly by one of these cutters I am at present prosecuting. I am returning to Gau almost at once to superintend a thorough spraying of the infected patches. I also wish in the interests of the planters there to make a careful inspection of all the gardens, in case there are others infected. By doing this I hope to prevent its spread to the coconuts. The ladybird parasite was present all through the island on the coconut trees, and I suggested to the natives to catch and transfer a number to their yaqona patches.

NOOGOORA BURR.

Mr. M. A. Forsyth, Levuka, reports as below for the month of October:—

Ovalau.—The position in regard to Ovalau and Moturiki is without change. *Clidemia hirta* has taken charge at Bureta Estate and spread over the whole area with remarkable rapidity. Across the river in the Fijian area Guinea and Para grass have a big hold.

Gau.—Consequent upon scale making its appearance on yaqona on this island, I returned on the 10th ultimo to deal with the attack and to investigate further. I visited every town on the island and carefully inspected each "tei-tei" for signs of the disease. This I found on yaqona in four

towns, viz., Lovo, Waikama, Levuka and Sawaike. In each case a few plants were badly attacked from roots upwards, including the leaves. Plants immediately adjacent were partially attacked, plants further away lightly infected while others were quite free. I formed the opinion that the badly-infected plants were those responsible for the introduction of the disease and that it was gradually spreading, and in time, after covering the yaqona, would spread further afield. I made every inquiry as to the origin of the plants and was informed that some came from Koro, some from Vanualevu, and possibly some had been brought from Tailevu. Bush trees adjoining the yaqona patches are as yet free from scale, and there is no sign any where of coconuts being infected. The badly-infected plants were destroyed by fire and the remainder treated with lime sulphur. A supply of this solution was left with the Buli of the district with instructions as to the further spraying of infected areas. The natives are now fully alive to the danger of neglect and I anticipate no trouble in preventing the spread of the disease. I will periodically visit and see that instructions are carried out and that there is no further outbreak.

Koro.—I am making arrangements to visit this area and inspect in the light of knowledge gained at Gau. Will take a supply of solution and deal with any infected area at once.

Wakaya.—No further spread of the disease is reported from here. Mr. King recently, wishing to show a sample of scale to a visitor, failed to locate any.

The presence of large numbers of the ladybird was particularly noticeable in all districts on Gau, practically every tree having its quota. On a yaqona patch at Lamere they were in swarms and had apparently cleared some of the plants of scale. There was evidence that it had been present.

Mr. H. V. G. Rivington reports visiting two islands of the Yasawa Group during October, when he found that no change was noticeable in regard to scale, probably accounted for by there having been practically no rain.

Mr. Rivington, Inspector of Plantations, reports that the hearing of the cases against certain occupiers of land at Ba who had failed to comply with orders given in respect of eradicating Noogoora Burr was adjourned *sine die* to enable the defendants to complete the work at once.

Mr. H. V. G. Rivington reports that he has, during October, inspected the districts of Ba, Tavua and Rakiraki, visiting lands as below with the results mentioned in the proper column:—

	No. of visits.	*No. cases burr seen.*
Land occupied by Europeans ..	10	1
Land occupied by Indians ..	7	4
Land of Fijian towns	6	4

In cases where burr was found, notices to destroy as provided by the Ordinance were issued, and subsequent visits showed these to have been acted upon.

INSPECTION OF PRODUCE.

The following is a resume of the work of the Inspector of Produce during the month of September :—Produce exported—Bananas, Sydney, 1,566 cases and 2,651 bunches; Melbourne, 8,961 cases and 8,043 bunches; Auckland, 30,952 cases and 475 bunches; equivalent to 94,127 bunches; also 344 sacks maize, 115 sacks kumalas, and 115 cases kumalas.

The following produce was exported during October:—To New Zealand—18,687 cases and 448 bunches of bananas, 503 cases of pineapples, 104 sacks of kumalas and 510 sacks of maize.

INSPECTION OF FRUIT.

The Inspector of Produce reports that the s.s. "Atua" loaded fruit for Auckland on 29th September. The fruit shipped consisted of 15,839 cases and 94 bunches of bananas, equivalent to 31,772 bunches. Rejections at the ship's side were 1,364 cases and 4 bunches, amounting to 8·6 per cent. of the shipment. Most of the rejections were for cases containing undersized and immature fruit. Some ripe fruit was fairly common in one line which also showed a number of unclean cases; new ones were substituted before shipment. The ship's holds were clean and care was taken during handling and stowing. Dunnage was plentifully used and air ventilation sufficient. The quality of the fruit was of better grade in general than of the recent shipments. A cutter load of fruit from Nadroga arrived too late for shipment by the "Atua." It was then taken in cases for shipment by the "Niagara," special permission being given in view of the fact that the fruit had been cut seven days prior to shipment. Twenty cases of pineapples were also shipped by this vessel.

R.M.S. "Niagara" sailed on 2nd October. The fruit shipment consisted of 237 cases bananas, being re-packed from the s.s. "Atua." Rejections amounted to 31 cases. The fruit was carefully handled and stowed. Information has since been received that this fruit reached Auckland in good order and realised a satisfactory price. The date of arrival in Auckland would mean that the fruit had been cut 12 days, showing that the Nadroga fruit carried well.

The s.s. "Mokoia" sailed for Auckland on 21st October, taking 364 cases of pineapples in splendid condition. The cases were carried on deck.

The s.s. "Atua" sailed for Auckland on 29th October, taking 17,553 cases and 448 bunches, equivalent to 35,554 bunches of bananas. To expedite loading, some 6,300 cases were put on the King's Wharf for night loading, which commenced at 8.30 p.m. on 28th October. The loading of this fruit was carefully done, the cases being wheeled to the ship's side on trucks instead of being taken up in slings. Loading from punts commenced at 7.30 a.m. on the 29th and was completed at 6.30 p.m. The rejections amounted to 10·5 per cent. of the shipment, a somewhat high percentage, due to ripe fruit, no doubt owing to the presence of much fruit which would have gone by the s.s. "Levuka" had she arrived. One whole punt load was rejected on account of an undue proportion of unsuitable fruit. On re-packing this fruit was subsequently exported in the s.s. "Waimarino." On the whole the shipment was good, being by far the best for some months. The ship's holds were in a good and clean condition and great care was taken with the stowing and handling of the cases. There was plenty of dunnage and the air vents were well arranged. On the whole the cases were clean, but some shippers are still inclined to economise in nails. The shipment also included 39 cases of pineapples and 104 sacks of kumalas. A little more care is desirable in preparing pines for shipment and in packing the fruit.

The s.s. "Waimarino" sailed for Wellington on 30th October, taking 897 cases of bananas and 304 cases of pineapples. One line of bananas only was not for this boat, the rest being repacked from the s.s. "Atua." The cases were stowed on deck and were carefully handled and stowed with proper air spaces. In all cases the punts were examined for signs of fumigation. Very little scale was seen and no live scale was found.

The s.s. " Suva " sailed for Melbourne on 9th November. The fruit cargo consisted of 9,187 bunches and 8,369 cases bananas, equivalent to 25,925 bunches. Rejections amounted to 2,075 bunches, or 8 per cent. of the shipment, and were mostly on account of fruit being too full or ripe. The bananas were of excellent quality, some of the bunches from Rewa being particularly fine. The timber of some of the cases was somewhat brittle, owing to the cases having been made up for the s.s. " Levuka " a month before. This appears to be a fault of the local timber, due no doubt to insufficient seasoning. The timber however appears to be quite as good for the purpose as imported timber provided it is used at once, or properly dried. The holds were clean and dunnage and air ventilation were ample. Handling and storing were very carefully carried out. The majority of the punts showed evident signs of having been fumigated, but some were doubtful so far as appearance only went; live scale however was not found. Since the report was written, news was received that some of the fruit was showing signs of ripening, when it was decided that the steamer should call first at Sydney to land ripe fruit. Later news was received to the effect that some 1,500 bunches had been landed in Sydney on account of ripeness.

The s.s. "Atua " loaded fruit for Auckland and sailed on 25th November. There were shipped 18,049 cases and 230 bunches of bananas, equivalent to 36,328 bunches. Rejection amounted to 1,629 cases and 10 bunches, equivalent to 9 per cent. of the cargo, and all were for ripeness, which is of course most frequently the cause of rejections during periods when the regularity of steamer sailings has been disturbed. The quality of the fruit was excellent, there being practically no immature fruit. The ship's holds were clean and the handling and stowing carefully carried out. Plenty of dunnage was used and air spaces were ample. No live scale was met with, and all punts had evidence of having been recently fumigated. Surplus fruit intended for shipment by this steamer amounting to 300 cases of bananas were put on the s.s. " Mokoia," which also took 507 cases of pineapples, both being carried on deck. Both steamers left for Auckland the same day.

INSPECTION OF BANANA PLANTATIONS.

Upper Rewa.

The Inspector of Produce reports that he left on Monday, 11th October, to inspect the banana plantations in the Upper Rewa district. The cultivations of seven native towns were inspected, thirteen visits paid to plantations of Europeans, and one to a Chinese-owned plantation.

On the whole the fruit shows signs of improvement, but the appearance of the plants still leaves much to be desired, and it was quite clear that the bananas are far from normal, although, in a few instances, cultivations in excellent condition were met with.

In the case of native-owned plantations, it certainly appears as if the attacks from which the plants have been suffering have not been so severe as on many European-owned cultivations, and this in spite of the vastly superior attention given in the case of the latter. Information has been received to the effect that higher up the river there are areas quite free from the appearances which have indicated the attack of some disease on the lower reaches of the river in the Upper Rewa district.

Bunchy-top.—Bunchy-top seems to be showing up more in new areas than among the older bananas. Indeed, great trouble has been experienced at times in getting a good stand of bananas. Without continual supplying, more careful selection of suckers for planting might help, but it is clear that the attack is worse than usual, although not so bad as was experienced not long ago.

Leaf spots.—The various leaf spots have been very prevalent on the Rewa during the last six months. It is suggested that, in readiness for the cold weather during the middle of the year, the banana cultivation should be considerably thinned out so as to give the selected remaining plants a better chance than they otherwise would have. At the same time the roots should be disturbed as little as possible, hence any ploughing done between the rows should take place after the cold weather when the growth of the plants is becoming more vigorous. Where labour and other conditions permit, it is suggested that a loosening of the soil by forking would be less detrimental to the plants and therefore to be preferred to ploughing. The West Indian system of forking every two years is recommended for trial.

Scale.—The scale *Aspidiotus sp.* was hardly to be found anywhere.

Early cutting.—The attention of shippers is called to the necessity for a careful regard for permitting fruit to reach a proper stage of maturity. Among native cultivations particularly the proportion of really mature fruit was very low. The high prices recently paid induce the natives to cut fruit at an immature stage, more resembling beans than bananas. On the other hand, a large proportion of fully mature fruit was seen on European plantations, which would have gone by the s.s. "Levuka" had she kept her time-table. The withdrawal of a steamer like the "Levuka", for a trip is a most serious inconvenience to the banana growers, and the recent uncertainty of steamers' sailings was given by native growers as a reason for their not planting up new areas.

INSPECTION OF VESSELS.

The following list shows the number of vessels inspected during the months of September to December under the Diseases of Plants Ordinance 1913 Regulations, and the number of cases in which material was destroyed:—

Port.	*No. of vessels inspected.*	*Cases in which material was destroyed.*
SEPTEMBER—		
Suva	5	—
Levuka	64	18
Lautoka	4	—
OCTOBER—		
Suva	4	2
Levuka	71	17
Lautoka	4	—
NOVEMBER—		
Suva	....	
Levuka	....	
Lautoka	....	
December—		
Suva	4	—
Levuka	57	19
Lautoka	4	1